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Reports
Bailey, J.

FINAL REPORT: RMRS-99094-RJVA

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Final Report
RMRS-99094-RJVA

"Using group selection, multi-aged management practices to enhance the use of prescribed fire in the Southwest"

May 30, 2004

Principal Investigator: John Bailey

The PURPOSE of this five-year agreement was to initiate studies demonstrating experimentally the use of multi-aged group selection silvicultural practices to augment fuel reduction strategies in the semi-arid Southwest, part of the national **Fire and Fire Surrogates Research Initiative**. This work was funded in multiple phases over five years and involved:

- Site selection and development of silvicultural prescription, including the marking of treatments;
- Permanent plot installation and treatment marking at a replicate sites each in Arizona and in New Mexico;
- Pre- and post-treatment data collection at all six sites in Arizona and New Mexico as treatment schedule allowed;
- Initial evaluation and comparison of pre- and post-treatment understory vegetation condition;
- Installation of grazing exclosures in each replicate treatment block as treatment schedule allowed; and
- Insect and disease surveys associated with pre- and immediate post-treatment environments.

Accomplishments:

We successfully sited the required three replicates **in Arizona**, developed and implemented multi-aged group selection harvesting treatments, and coordinated prescribed burning treatments with Forest Service staff. Permanent plots were established and monumented. Overstory structural vegetation, understory condition, and insect and disease presence was appropriately monitored after fuels/vegetation treatments, and in conjunction with proposed prescribed fire treatments, in Arizona; however, the original treatment schedule was slowed such that the last part of those treatments was completed only six months ago. The ultimate data analyses, therefore, have not been completed to date. We will issue a draft RMRS General Technical Report by Summer 2005. That report will address the details of fuels treatment objectives and strategy, establishment of treatments, operational and economic implications, resultant vegetation conditions, and ultimate fuel reduction levels. We will conclude with an overall assessment of treatment effectiveness in the near- and long-term.

In defense of our productivity record, five years would have been sufficient to analyze data and write that report had the experiment been established in 1999. However, the project objectives and funding were geared predominantly to the creation and implementation of the treatments, which has been completed. Additional funding in another agreement will ultimately complete the

required reporting component. Some preliminary summary maps and tables are, however, attached from the Arizona sites to document the five years of work in establishing these Arizona study sites.

Study sites in the Jemez Mountains of New Mexico were originally scheduled to lag one year behind Arizona. Northern Arizona University inherited these sites during the second year, once they were already behind schedule due to wildfires in the areas destroying two of the original sites. A third site was lost to wildfire after NAU assumed control of the New Mexico data collection. The resulting schedule is now much more than the one year behind the Arizona sites and those data will be collected and available at another date. However, the treatments have been marked and permanent plots established absolutely consistent with Arizona.

Extra Collaborations:

The Silviculture Lab at Northern Arizona University has been at the foci of most activities on these sites and as such, we have been collaborating with many investigators. In many cases, this has involved additional data collection and summary, including:

- Mapping spatial arrangement of trees, crucial to understanding and predicting both fire behavior (LANL).
- Mapping and measuring standing snags over the entire area (NAU)
- Summarizing stand data for evaluation of insect and wildlife responses (NAU, CSU)

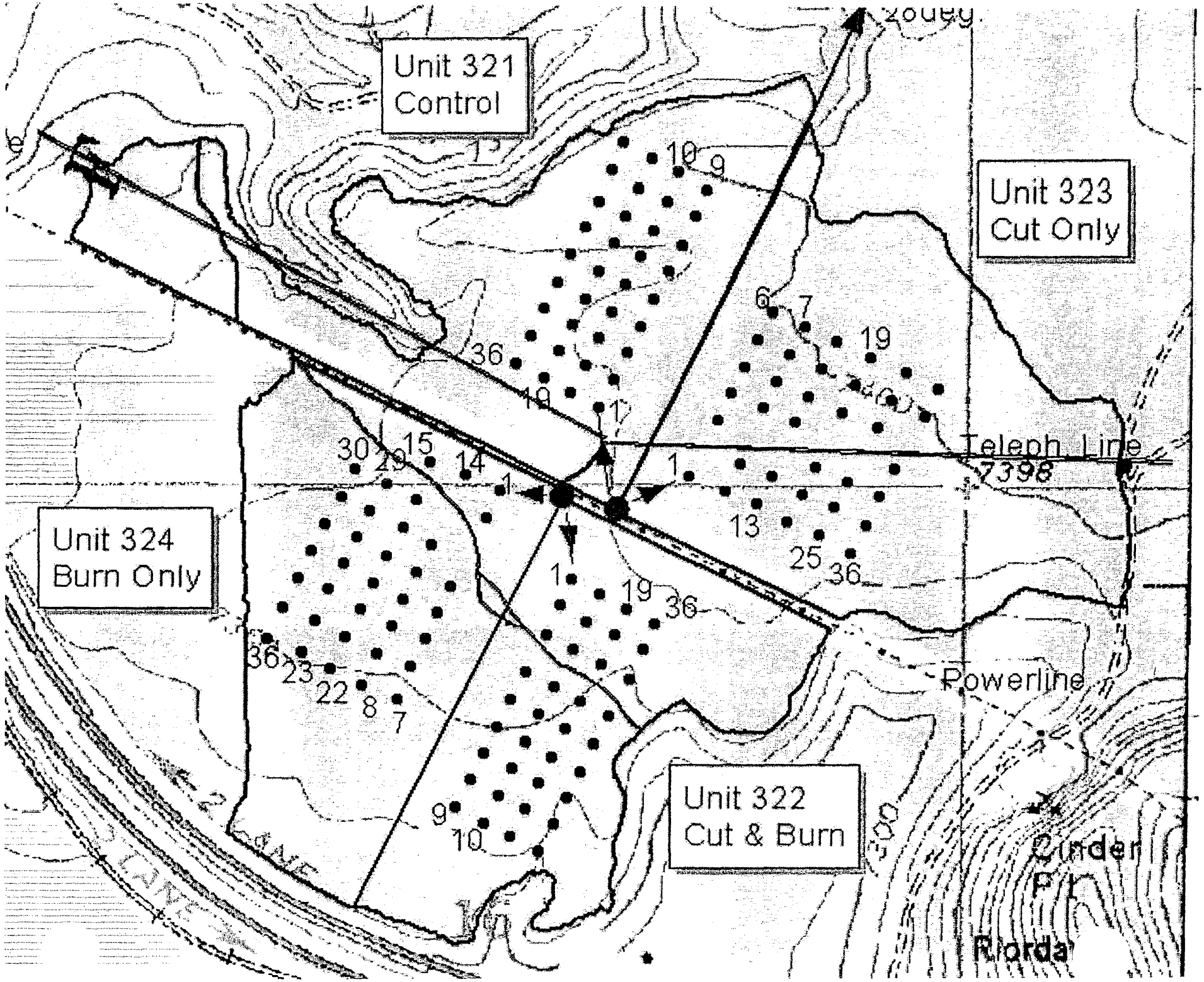
Presentations:

J. D. Bailey. "Stand Structure and Ecological Restoration" **Ecological Restoration Institute – Short Course**. April, 2003 in Flagstaff, AZ.

J.D. Bailey. "Sustainable Forest Management in the Semi-arid Southwest: Amazing parallels to the "non-arid" Northwest" **USFS Pacific Northwest Research Station**. March, 2003 in Olympia, WA.

Z. Chen, J.D. Bailey, K. Clancey and M. Wagner. 2002. Entomological research on the fire and fire surrogate treatments in Arizona and New Mexico. Poster at: **National Forest Protection Coordination Conference**. April 16-17, 2002 in Madison, WI.

J.D. Bailey and Marc Trenam. 2001. Implementing fire and fire surrogate treatments in northern Arizona ponderosa pine forests – changes in stand structure with and after treatment. Presentation at: **6th Biennial Conference of Research on the Colorado Plateau**. November 5-9, 2001 in Flagstaff, AZ.


Unit 321
Control
Unit 323
Cut Only
Unit 324
Burn Only
Unit 322
Cut & Burn
Teleph Line
7398
Powerline
Florida
10
9
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36
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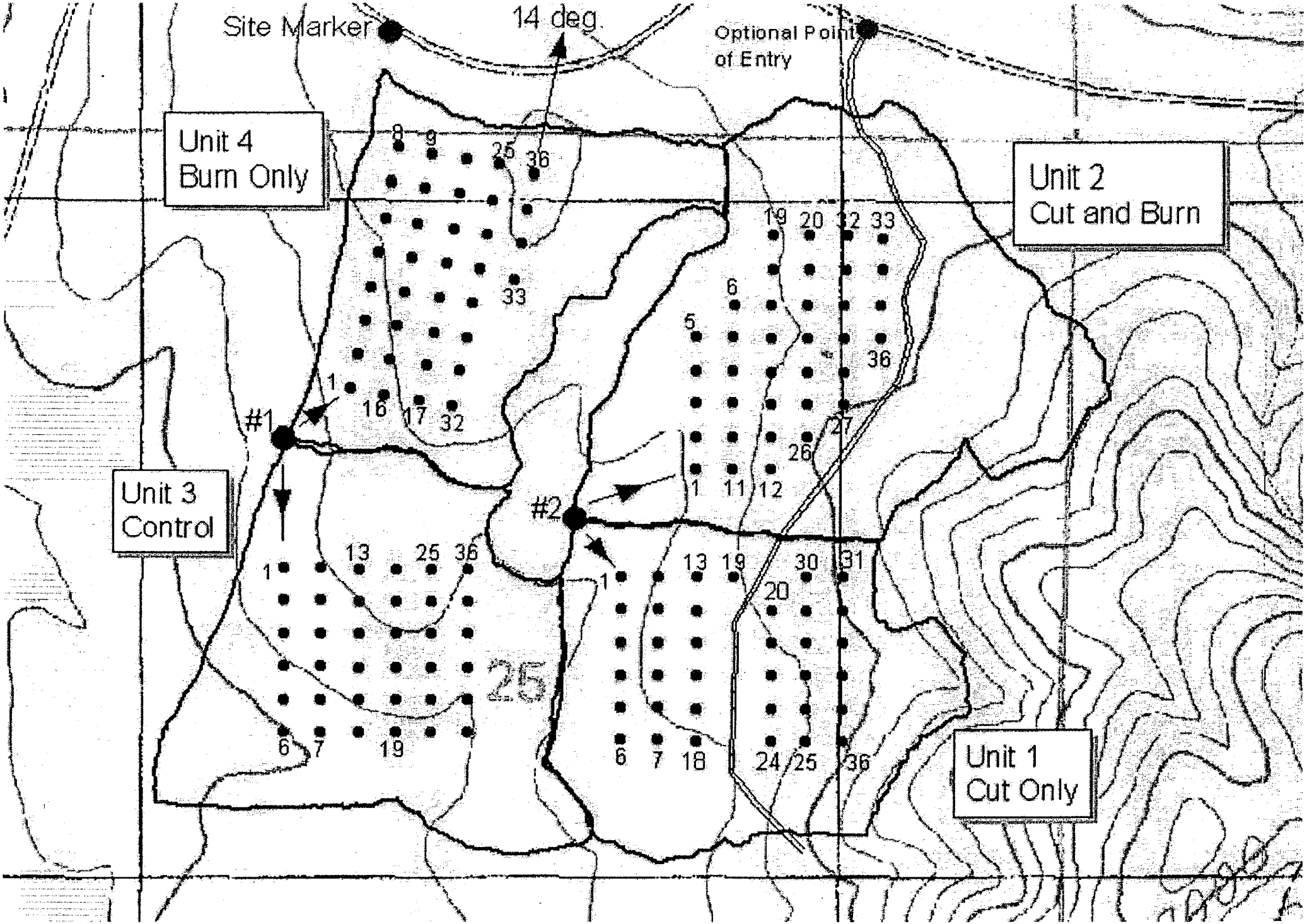
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14 deg.
Optional Point of Entry
Unit 4
Burn Only
Unit 2
Cut and Burn
Unit 3
Control
Unit 1
Cut Only
#1
#2
8 9 25 36
33
1 16 17 32
19 20 32 33
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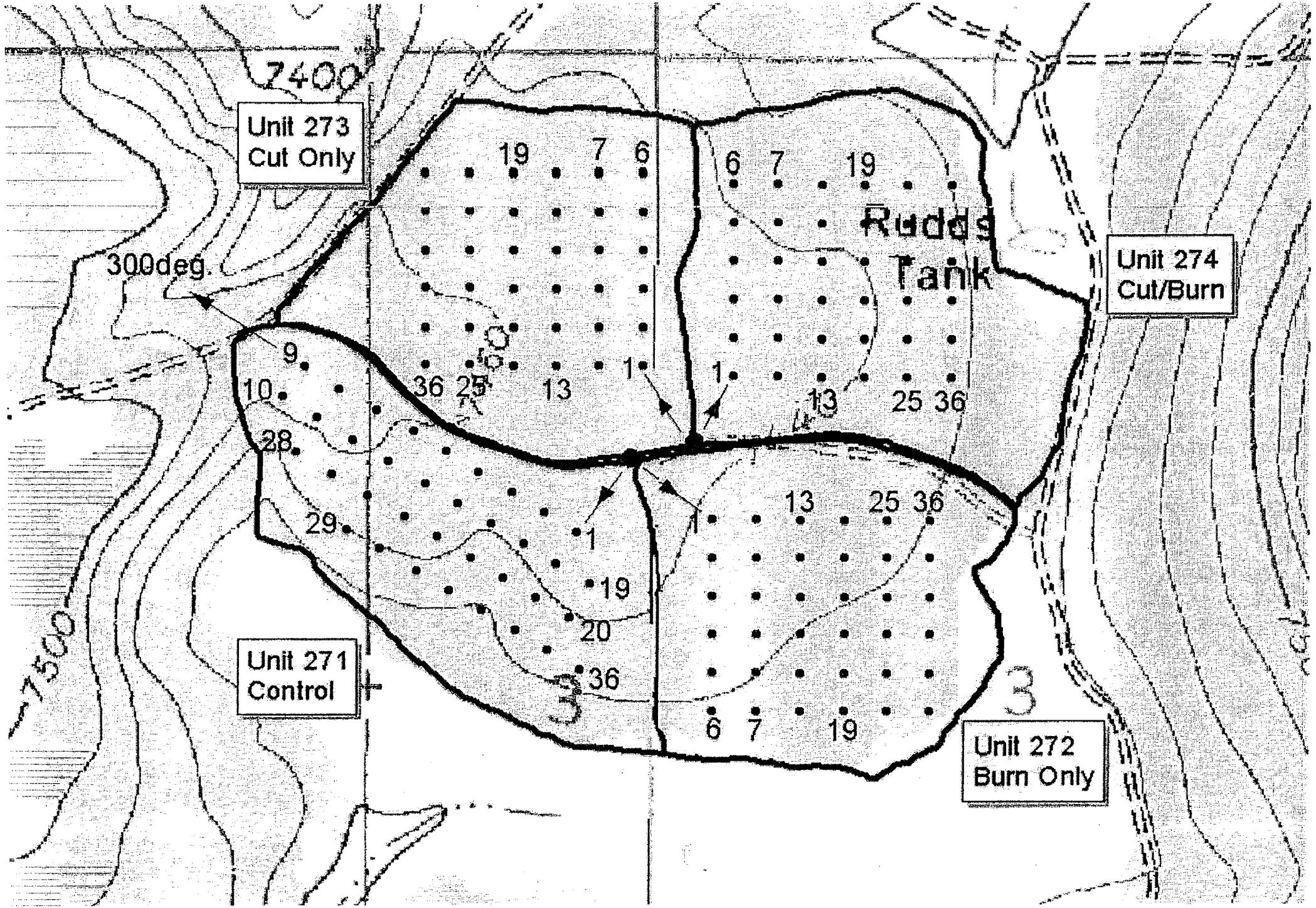
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Unit 273
Cut Only
300deg.
19 7 6
6 7 19
Rudds
Tank
Unit 274
Cut/Burn
9
10
28
29
36 25
13
1
1
13
25 36
13 25 36
1
19
20
36
Unit 271
Control
7500
6 7 19
Unit 272
Burn Only

FFS Standing Dead and Snag Characteristics

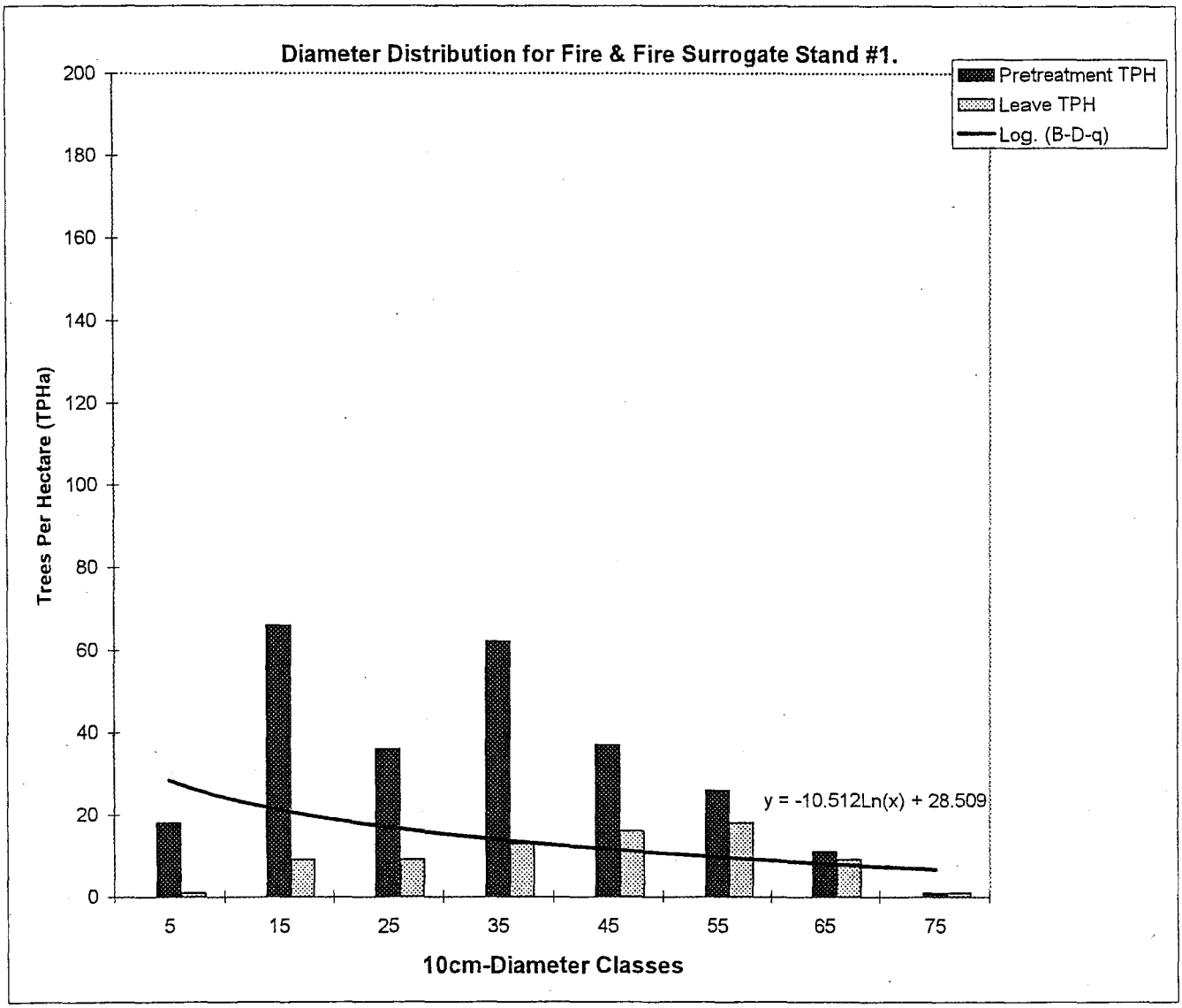
Stand #	Treatment	Spp	Dead HT	Dead Decay	Dead/H	QMD Dead	BA/H Dead	Snag HT	Snag Decay	Snags/H	QMD Snag	BA/H Snag
1	cut	J	3.4	2.8	13	9.5	0.09			0		0.00
		P	4.4	2.7	5	11.5	0.05			0		0.00
		Q	4.0	3.5	4	22.8	0.12			0		0.00
	1 Total		3.7	3.0	22	14.7	0.26			0		0.00
2	cut and burn	J	3.2	2.0	2	8.8	0.01			0		0.00
		P	7.9	2.7	4	21.7	0.11	16.4	3.0	1	39.6	0.12
		Q	4.7	3.0	1	12.0	0.01			0		0.00
	2 Total		5.8	2.5	7	16.9	0.14	16.4	3.0	1	39.6	0.12
3	control	P	3.2	3.0	5	8.3	0.03	5.6	4.0	1	40.5	0.13
4	burn	P	3.7	3.0	4	10.1	0.03	8.7	3.3	3	39.4	0.43
271	control	P	7.8	2.1	28	19.2	0.76	4.6	4.0	1	96.5	0.73
272	burn	P	9.4	2.1	15	23.1	0.49	3.3	4.0	4	55.0	0.95
273	cut	P	5.9	2.5	38	15.4	0.64			0		0.00
274	cut and burn	P	6.1	2.1	15	14.4	0.20	1.9	4.0	1	38.1	0.11
321	control	P	6.2	1.9	19	13.5	0.28	20.0	3.0	1	40.8	0.13
322	cut and burn	P	3.5	2.5	10	13.3	0.14			0		0.00
323	cut	P	6.7	2.5	23	18.6	0.47	3.3	3.0	1	66.1	0.34
324	burn	P	8.0	2.0	26	17.7	0.55	5.1	3.7	3	52.6	0.65

Subplot Observations for FFS

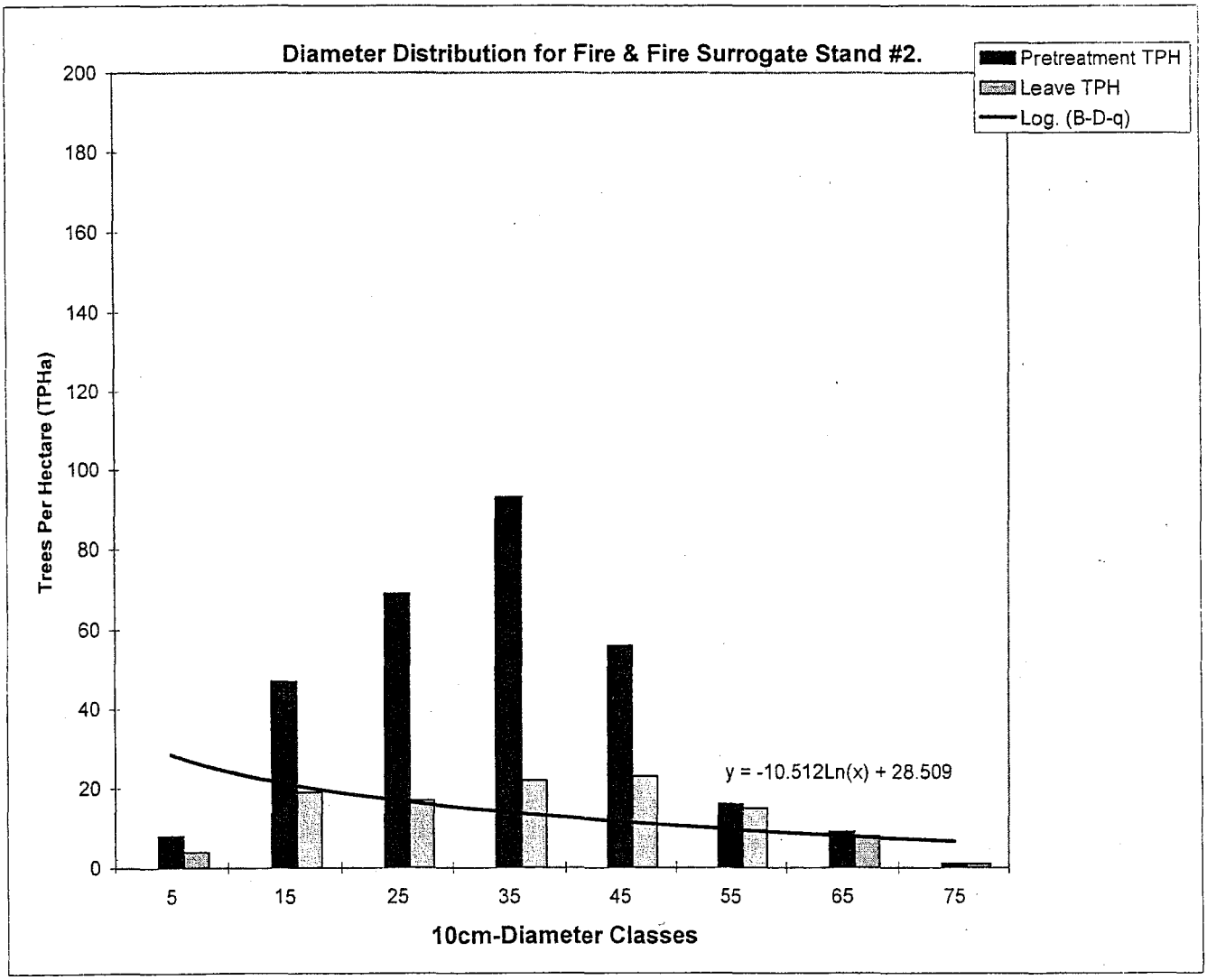
Stand #	Treatment	Pine Seedlings/Hectare	Oak Seedlings/Hectare	Juniper Seedlings/Hectare	Total Seedlings/Hectare	Pathogens	Bark Beetles
1	cut	13	344	70	427	0%	0%
2	cut and burn	7	273	10	290	0%	0%
3	control	9	0	35	44	10%	0%
4	burn	3	2	11	16	0%	20%
271	control	19	0	0	19	0%	30%
272	burn	15	0	0	15	10%	20%
273	cut	9	0	0	9	0%	40%
274	cut and burn	26	0	0	26	0%	40%
321	control	1	0	0	1	0%	40%
322	cut and burn	44	0	0	44	0%	0%
323	cut	1	0	0	1	0%	40%
324	burn	3	0	0	3	0%	60%
Totals		13	52	11	75	2%	24%

Stand #	Treatment	Point	Transect	Count of spp	Average of Decay	Average of LED	Average of SED	Average of LOID	Average of Length	Average of piece	Sum of IV
1	cut	3	s	1	3.0	55.2	10.9	52.8	25.6	1.9	0
1	cut	16	s	6	4.0	38.3	15.8	37.5	3.1	2.3	6
1	cut	21	s	1	4.0	15.0	13.5		4.0	4.0	1
1	cut	23	s	2	4.0	18.9	10.2	16.1	3.7	1.7	1
1	cut	25	n	2	4.0	60.1	29.6		1.5	1.5	2
1	cut	25	s	3	3.0	17.2	7.6	31.3	3.2	2.3	2
2	cut and burn	4	n	1	4.0	17.3	7.6	10.9	5.0	3.6	1
2	cut and burn	4	s	1	4.0	60.7	7.6	18.4	5.6	4.3	1
2	cut and burn	8	s	1	4.0	20.6	14.9		1.2	1.2	1
2	cut and burn	10	n	2	4.0	18.2	13.2	16.1	7.1	5.7	2
2	cut and burn	13	n	1	4.0	25.3	14.9	21.5	5.4	2.5	0
2	cut and burn	14	n	1	5.0	44.5	8.3	47.2	5.8	1.0	0
2	cut and burn	16	n	1	5.0	16.7	7.6	11.2	2.8	0.9	0
2	cut and burn	25	n	2	3.5	27.2	16.1	22.4	7.0	3.5	1
2	cut and burn	25	s	3	3.7	27.5	10.0	17.4	3.5	2.2	2
2	cut and burn	26	s	2	3.5	45.3	18.0	30.6	12.6	4.8	1
2	cut and burn	30	s	1	4.0	32.3	13.2	21.8	5.9	4.1	1
3	control	7	n	3	3.7	36.0	8.6	26.8	6.3	8.0	3
3	control	7	s	1	3.0	17.5	7.6	13.7	6.1	4.5	1
3	control	9	n	2	4.0	16.4	7.6	10.9	4.2	2.6	1
3	control	9	s	2	4.0	18.0	7.6	7.6	1.8	0.1	1
3	control	18	s	9	3.3	20.3	9.0	12.5	5.1	1.9	6
3	control	21	s	1	4.0	15.8	7.6	13.1	1.0	0.5	0
3	control	22	n	1	4.0	19.1	7.6	15.0	1.6	0.3	0
3	control	22	s	1	4.0	21.6	11.3		2.0		1
3	control	28	n	1	5.0	17.1	7.6	14.2	6.5	4.1	1
4	burn	1	n	2	3.0	24.8	7.6	9.4	4.2	2.0	1
4	burn	4	s	1	4.0	23.7	13.8		1.2		1
4	burn	10	n	1	4.0	18.2	7.6		1.6		1
4	burn	13	s	1	4.0	15.0	7.6		1.8		1
4	burn	23	n	1	4.0	35.2	7.6	23.8	7.7	3.6	0
271	control	11	s	1	4.0	15.7	8.7	22.3	4.2	0.8	0
271	control	13	s	2	2.0	20.3	7.6	14.3	5.5	2.3	1
271	control	17	n	3	4.3	24.8	14.4	27.4	9.0	0.9	2
271	control	18	n	1	3.0	18.7	7.6	10.9	2.1	1.7	1
271	control	18	s	2	2.0	26.4	8.1	17.6	6.7	1.2	0
271	control	21	s	5	3.4	34.8	19.6	31.3	5.6	0.4	1
271	control	22	n	1	4.0	17.8	7.6	17.9	4.1	0.1	0
271	control	22	s	1	4.0	22.4	7.6	12.5	3.9	1.0	0
271	control	24	n	2	4.5	20.8	13.2	27.4	2.3	0.6	1
271	control	27	s	4	4.0	32.6	8.4	22.8	4.9	3.4	4
271	control	32	n	1	4.0	47.2	30.3		1.3		1
271	control	32	s	2	4.5	25.4	15.3	29.4	1.7	1.2	2
272	burn	4	n	5	3.2	30.9	10.3	21.9	6.5	4.2	4
272	burn	6	n	2	4.5	18.7	13.2		1.1		2
272	burn	7	s	2	4.0	18.1	12.0	16.7	1.5	0.8	2
272	burn	9	n	3	4.0	29.9	13.4	19.4	5.3	2.1	1
272	burn	17	s	5	4.6	28.1	19.2	46.8	6.9	3.2	5
272	burn	18	s	1	4.0	20.0	7.6		1.4		1
272	burn	22	n	1	4.0	15.3	8.4		2.5		1
272	burn	22	s	1	4.0	17.0	14.6	18.2	5.0	4.0	1
272	burn	27	n	4	4.3	25.3	9.8	32.7	2.4	0.6	2
273	cut	9	n	2	3.5	18.6	12.0	11.2	5.1	1.2	1
273	cut	11	n	4	4.5	28.2	16.3	22.1	3.3	1.7	2
273	cut	11	s	4	3.5	22.7	9.9	14.0	4.7	2.4	3
273	cut	21	n	4	4.0	33.2	17.5	23.3	3.8	2.0	1
273	cut	22	n	4	3.3	18.1	8.3	11.7	5.9	3.0	2
273	cut	22	s	1	5.0	132.5	114.2	113.4	4.4	3.4	1
273	cut	26	s	3	4.0	28.6	17.0	11.2	3.4	2.4	2
273	cut	27	n	5	4.6	21.6	9.7	12.3	2.4	3.6	5
273	cut	29	n	4	3.8	27.8	12.0	19.9	7.1	1.9	1
273	cut	29	s	1	4.0	24.2	12.3	24.2	2.5	2.5	1
273	cut	32	s	2	4.0	29.3	16.1	25.8	2.5	1.2	1
273	cut	33	s	3	4.0	28.9	12.9	24.3	3.7	0.9	2
273	cut	34	s	7	4.6	25.6	13.8	23.3	4.1	3.1	6
274	cut and burn	2	n	5	4.4	18.4	9.4	16.4	5.9	4.8	5
274	cut and burn	2	s	5	3.2	16.1	8.1	10.7	5.0	3.7	3
274	cut and burn	8	n	1	5.0	58.4	37.3		1.2		1
274	cut and burn	10	n	3	4.3	19.3	13.7	20.0	2.0	1.1	2
274	cut and burn	10	s	1	5.0	15.2	7.6	46.2	14.1	3.2	0
274	cut and burn	15	n	3	4.7	35.6	18.5	35.4	3.3	1.6	1
274	cut and burn	15	s	3	4.7	35.1	17.1	23.6	9.8	3.2	2
274	cut and burn	17	n	1	3.0	15.0	8.5	8.6	1.4	1.0	1
274	cut and burn	24	n	2	4.5	21.5	10.7	16.7	3.0	3.2	2
274	cut and burn	24	s	4	3.8	17.6	10.0	16.7	2.0	1.3	2
274	cut and burn	25	n	2	4.5	15.9	9.7	22.2	2.4	2.8	2
274	cut and burn	25	s	6	3.7	19.0	10.4	14.0	2.7	2.0	4
274	cut and burn	29	n	3	5.0	32.5	13.6	21.9	1.9	0.8	1
321	control	14	n	3	3.7	19.0	9.7	10.9	1.9	0.9	3

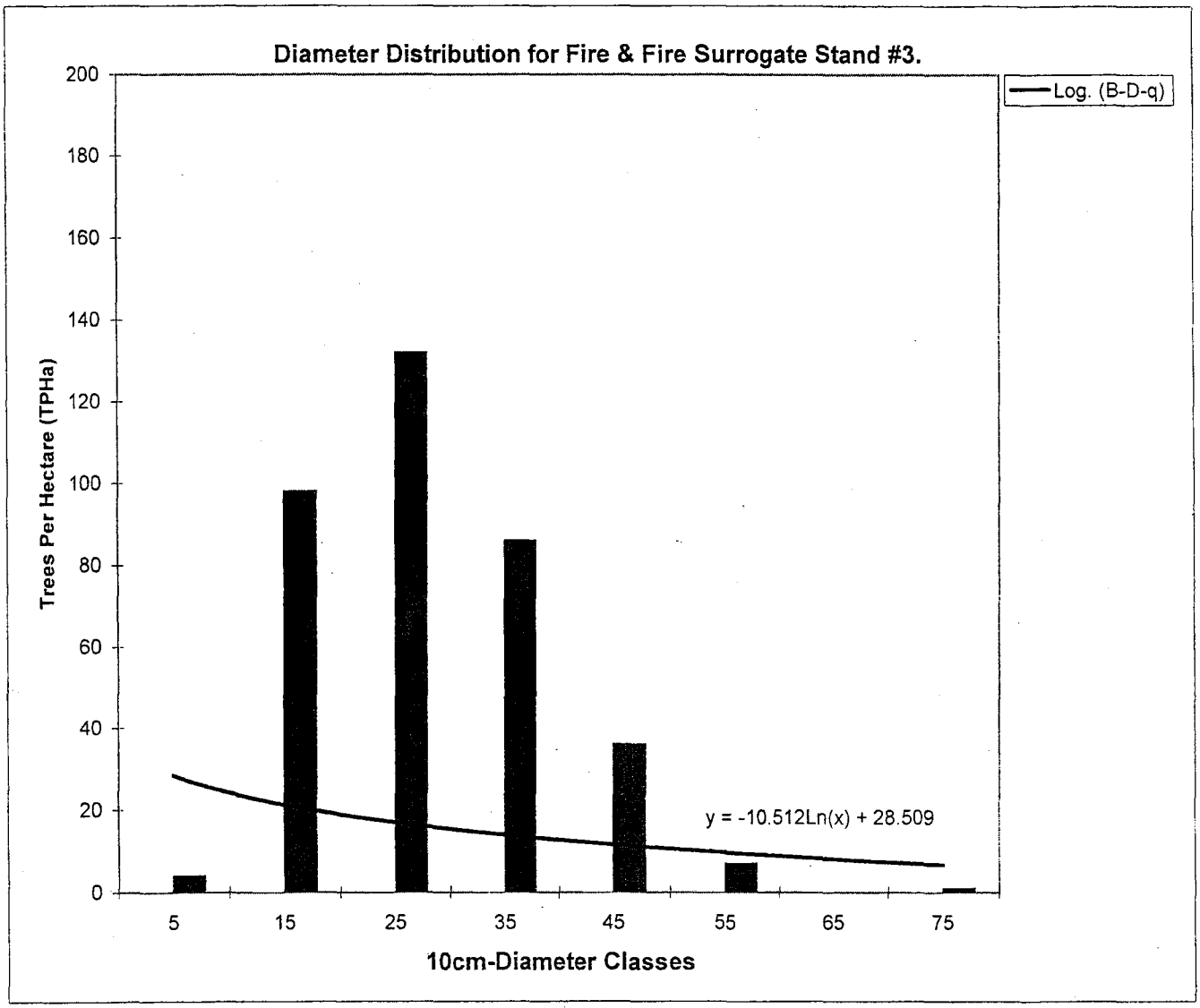
321	control	14	s	2	2.5	18.3	10.5		4.5		2
321	control	15	n	2	2.5	18.3	10.5		4.5		2
321	control	16	s	2	4.0	28.4	22.4	33.7	1.6	1.2	2
321	control	22	n	1	4.0	15.7	9.4		1.5		1
321	control	24	s	1	2.0	15.1	9.8		1.7		1
321	control	31	n	1	4.0	23.2	10.3	15.2	5.4	0.8	0
321	control	32	n	1	5.0	63.5	16.5	53.2	11.8	4.7	0
321	control	32	s	1	3.0	15.2	7.6	12.3	5.6	3.4	1
321	control	34	s	1	4.0	29.3	7.6		1.0		1
322	cut and burn	11	n	1	2.0	17.3	14.2	16.3	1.4	1.2	1
322	cut and burn	12	s	1	2.0	17.3	14.2	16.3	1.4	1.2	1
322	cut and burn	21	s	4	2.3	17.1	9.2	12.0	4.6	2.5	2
322	cut and burn	27	n	2	3.5	18.0	7.6	11.2	3.5	1.8	1
323	cut	3	n	1	4.0	16.8	12.1	14.8	4.0	2.0	0
323	cut	5	s	1	4.0	15.0	8.9	27.5	3.6	2.2	1
323	cut	9	n	1	3.0	18.2	15.0	16.1	3.5	1.6	0
323	cut	10	n	1	4.0	24.5	16.5	18.8	5.0	3.4	1
323	cut	10	s	1	3.0	28.1	11.5	22.2	1.8	0.4	0
323	cut	12	n	1	5.0	35.0	25.9		1.4		1
323	cut	12	s	2	4.0	48.7	9.2	53.5	8.0	4.8	1
323	cut	20	n	2	3.0	15.4	12.6	13.8	1.8	1.6	1
323	cut	20	s	4	4.5	31.5	20.4	18.6	1.4	1.0	3
323	cut	24	n	2	4.0	15.6	10.7	18.8	1.4	1.2	2
323	cut	24	s	2	3.5	18.4	9.3		2.0		2
323	cut	25	n	1	4.0	17.2	12.3	8.3	2.8	1.9	1
323	cut	25	s	2	3.0	16.0	7.6	7.8	4.7	4.3	2
324	burn	17	s	2	3.0	23.2	7.7	15.4	1.9	1.2	1
324	burn	19	n	1	3.0	15.6	7.6	13.4	5.6	4.4	1
324	burn	22	n	1	3.0	16.6	7.6	14.0	2.9	2.2	1
324	burn	22	s	1	4.0	49.5	7.6	50.2	3.5	0.4	0
324	burn	23	n	2	3.0	15.6	7.6	10.2	2.0	2.0	2
324	burn	23	s	1	4.0	15.0	7.6		1.6		1
324	burn	26	n	1	3.0	15.8	7.6	9.7	5.7	3.8	1
324	burn	27	n	7	2.9	16.5	8.8	15.6	3.1	1.2	4
324	burn	31	n	2	4.5	19.3	7.6	14.7	2.2	0.5	1
324	burn	35	s	2	3.5	18.3	7.6	8.0	1.8	1.3	2
				254	3.8	25.1	12.3	21.1	4.1	2.3	173



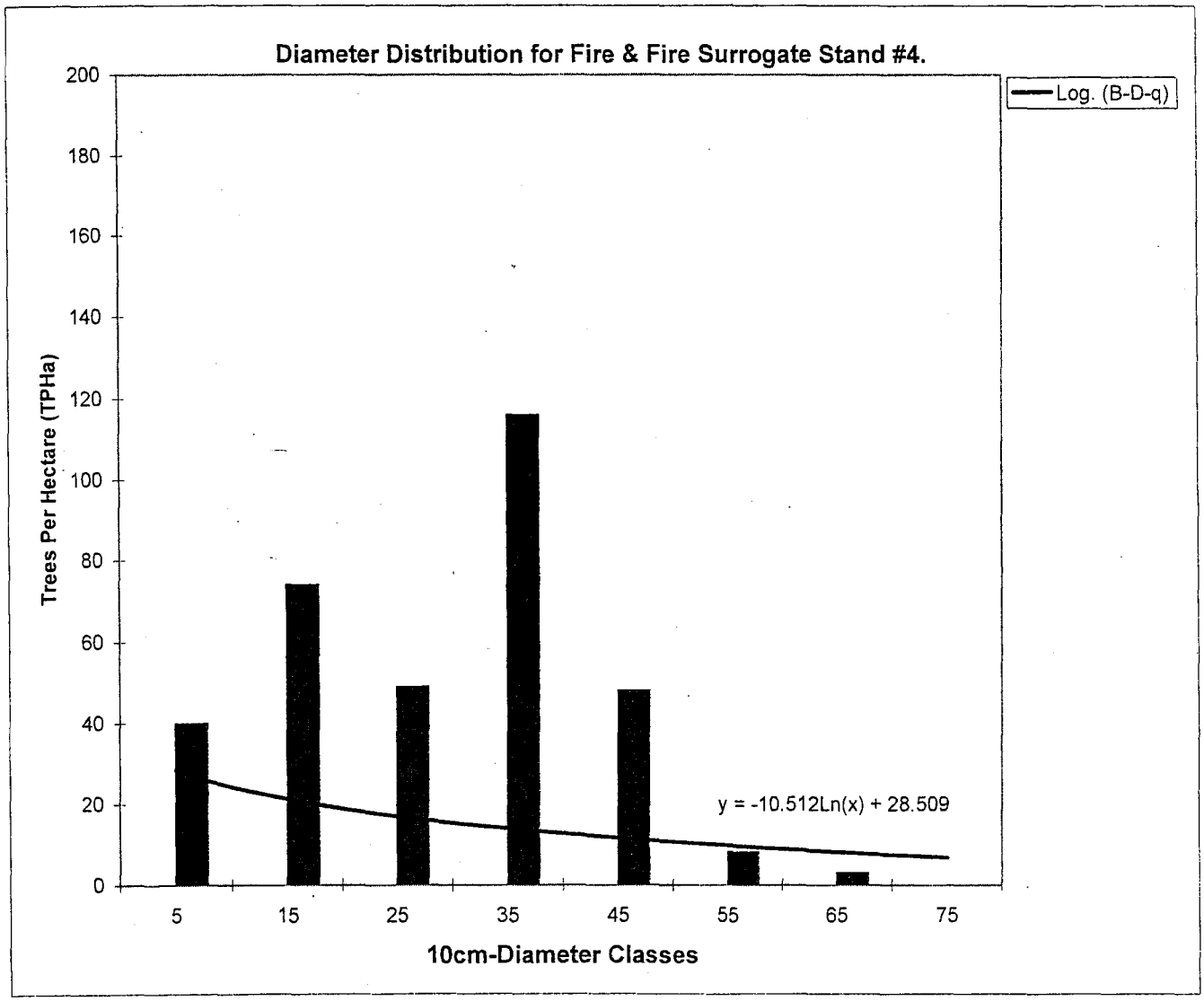
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	18	66	36	62	37	26	11	1	257
Leave TPH	1	9	9	13	16	18	9	1	76
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	4.2	9.0	13.1	16.8	19.4	22.4	24.3	28.4	
Average H:D	89	57	52	48	43	41	38	39	
Average % H:D > 80	11%	11%	0%	0%	0%	0%	0%	0%	
Average LCR	45%	58%	55%	60%	60%	62%	66%	71%	
Keen's % A or B	0%	2%	0%	5%	0%	12%	0%	0%	



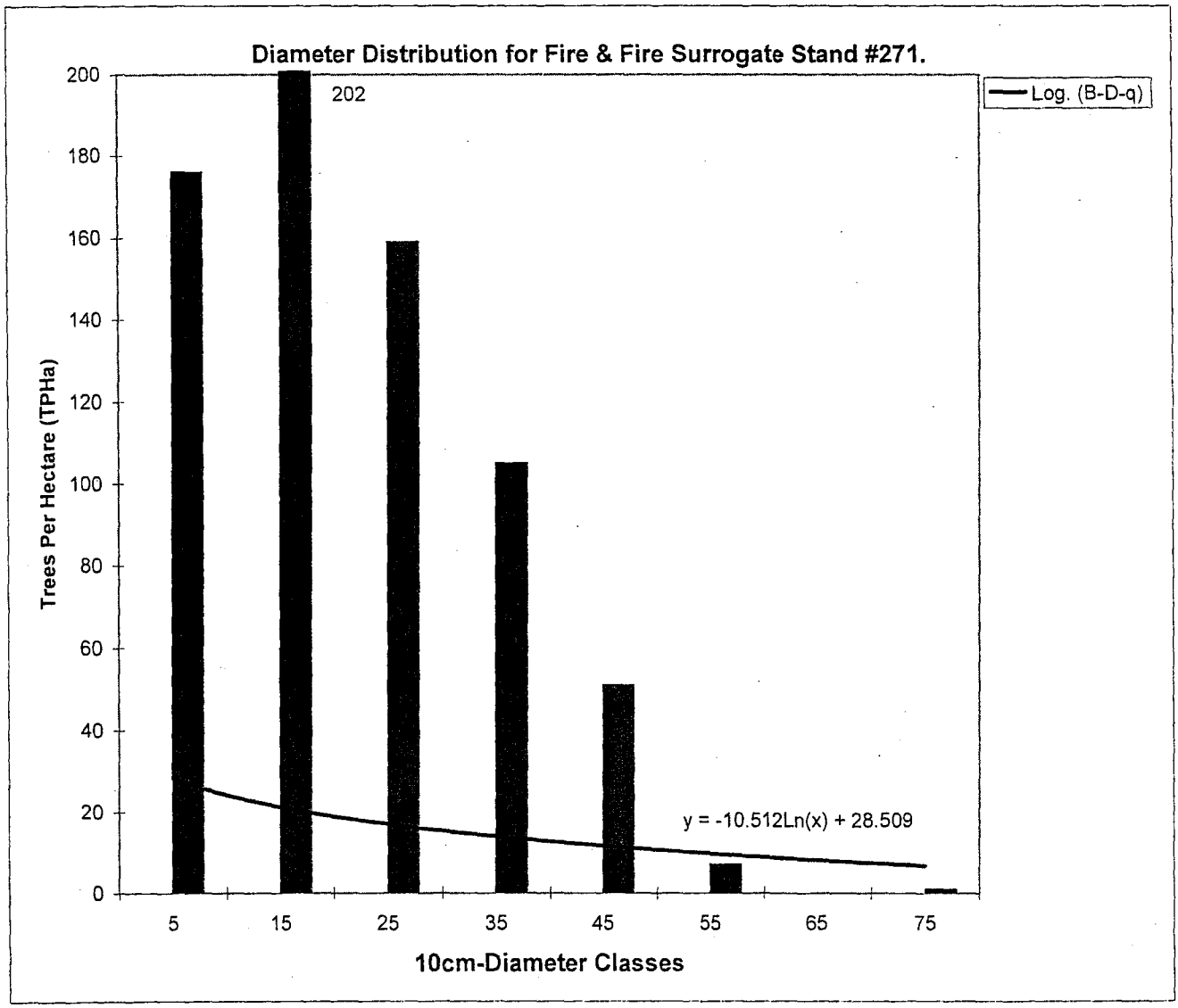
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	8	47	69	93	56	16	9	1	299
Leave TPH	4	19	17	22	23	15	8	1	109
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	5.2	10.3	13.3	17.8	22.0	22.0	23.4	23.1	
Average H:D	153	61	56	51	50	41	37	31	
Average % H:D > 80	13%	6%	0%	0%	4%	0%	0%	0%	
Average LCR	53%	60%	60%	57%	58%	60%	64%	76%	
Keen's % A or B	25%	8%	4%	4%	2%	13%	11%	100%	



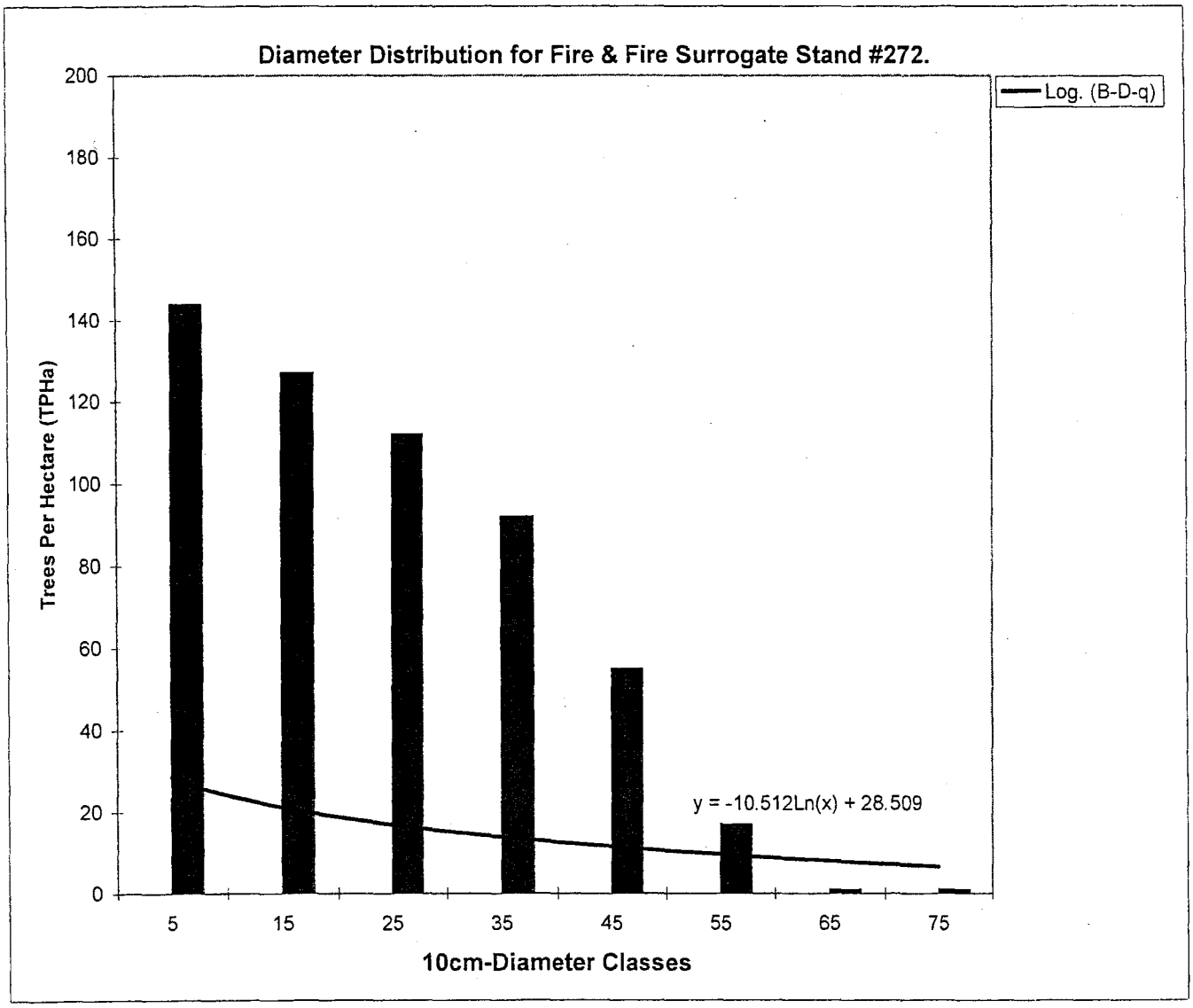
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
TPH	4	98	132	86	36	7	0	1	364
B-D-q	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	1.7	9.0	11.5	15.1	18.1	20.2		24.3	
Average H:D	118	56	48	44	41	37		35	
Average% H:D > 80	100%	3%	0%	0%	0%	0%		0%	
Average LCR	79%	52%	58%	64%	61%	69%		67%	
Keen's % A or B	50%	11%	14%	22%	7%	43%		0%	



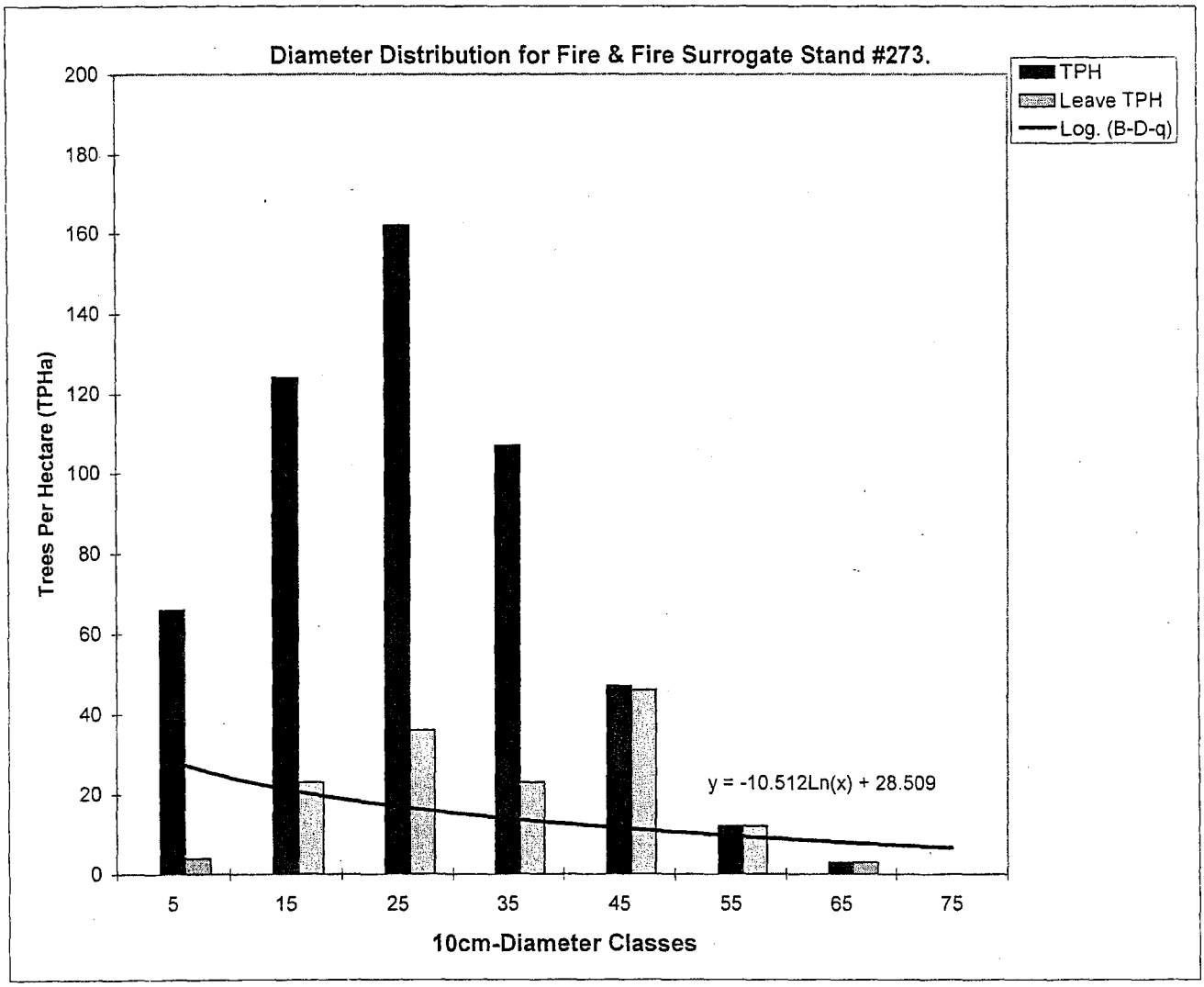
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
TPH	40	74	49	116	48	8	3	0	338
B-D-q	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	4.0	8.1	15.5	18.4	20.5	22.6	24.2		
Average H:D	102	55	59	52	47	43	37		
Average % H:D > 80	23%	2%	2%	0%	0%	0%	0%		
Average LCR	51%	53%	58%	60%	60%	66%	64%		
Keen's % A or B	7%	18%	11%	4%	20%	43%	0%		



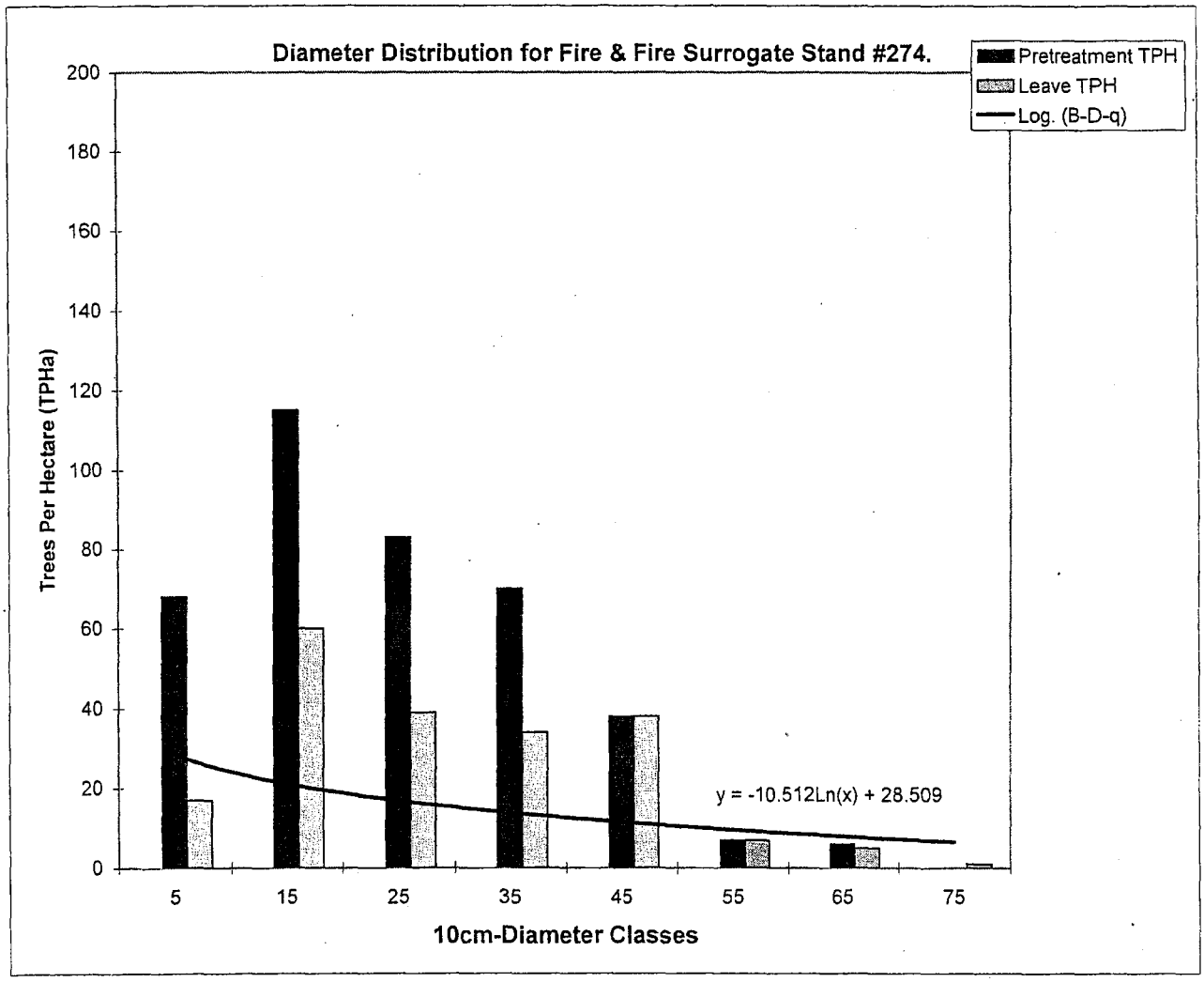
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
TPH	176	202	159	105	51	7	0	1	701
B-D-q	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	4.5	10.1	14.3	17.4	19.2	21.4		23.5	
Average H:D	74	65	53	50	44	40		30	
Average % H:D > 80	31%	24%	1%	0%	0%	0%		0%	
Average LCR	43%	48%	50%	52%	58%	64%		66%	
Keen's % A or B	9%	18%	7%	15%	6%	14%		100%	



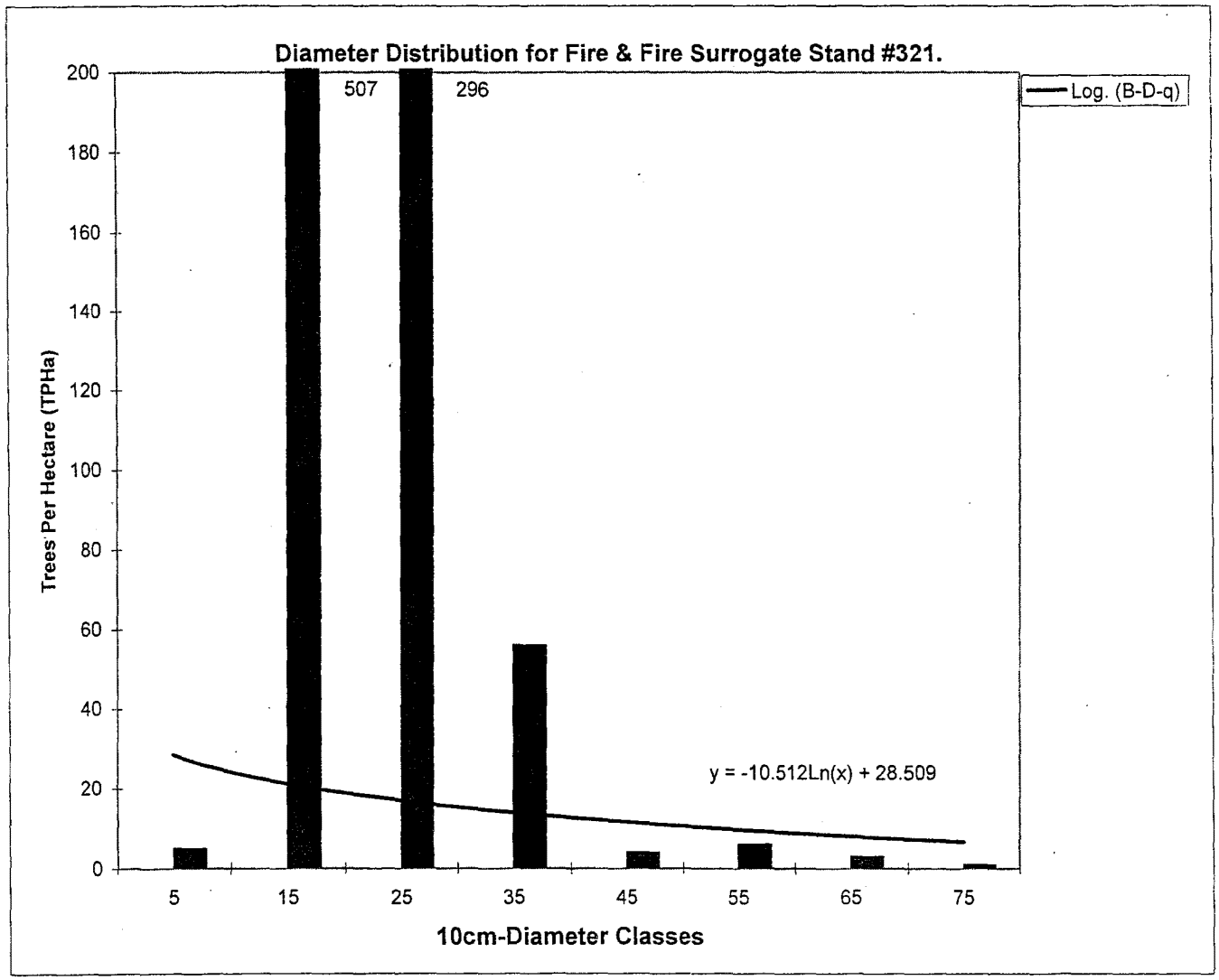
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
TPH	144	127	112	92	55	17	1	1	549
B-D-q	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	4.3	9.1	12.7	15.7	18.4	20.9	18.5	29.9	
Average H:D	97	64	51	43	42	38	30	39	
Average % H:D > 80	48%	19%	0%	0%	0%	0%	0%	0%	
Average LCR	53%	55%	58%	58%	60%	57%	65%	72%	
Keen's % A or B	5%	9%	15%	6%	20%	35%	0%	100%	



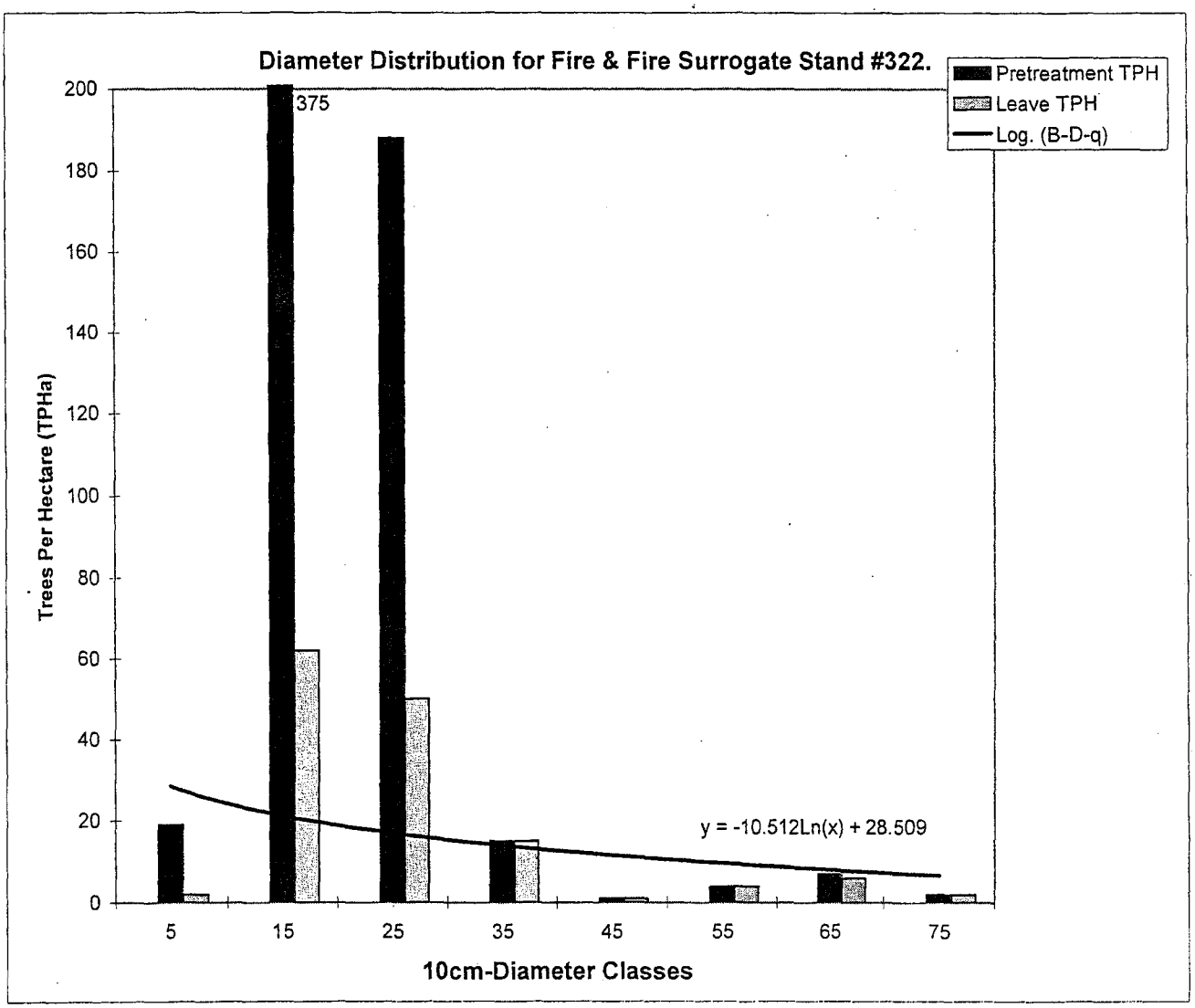
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	66	124	162	107	47	12	3	0	521
Leave TPH	4	23	36	23	46	12	3		147
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	3.9	10.2	14.5	18.9	21.3	22.2	25.2		
Average H:D	79	68	60	55	48	42	39		
Average % H:D > 80	37%	26%	0%	0%	0%	0%	0%		
Average LCR	37%	47%	51%	53%	56%	59%	59%		
Keen's % A or B	0%	4%	6%	0%	5%	25%	67%		
TPA	27	50	66	43	19	5	1	0	



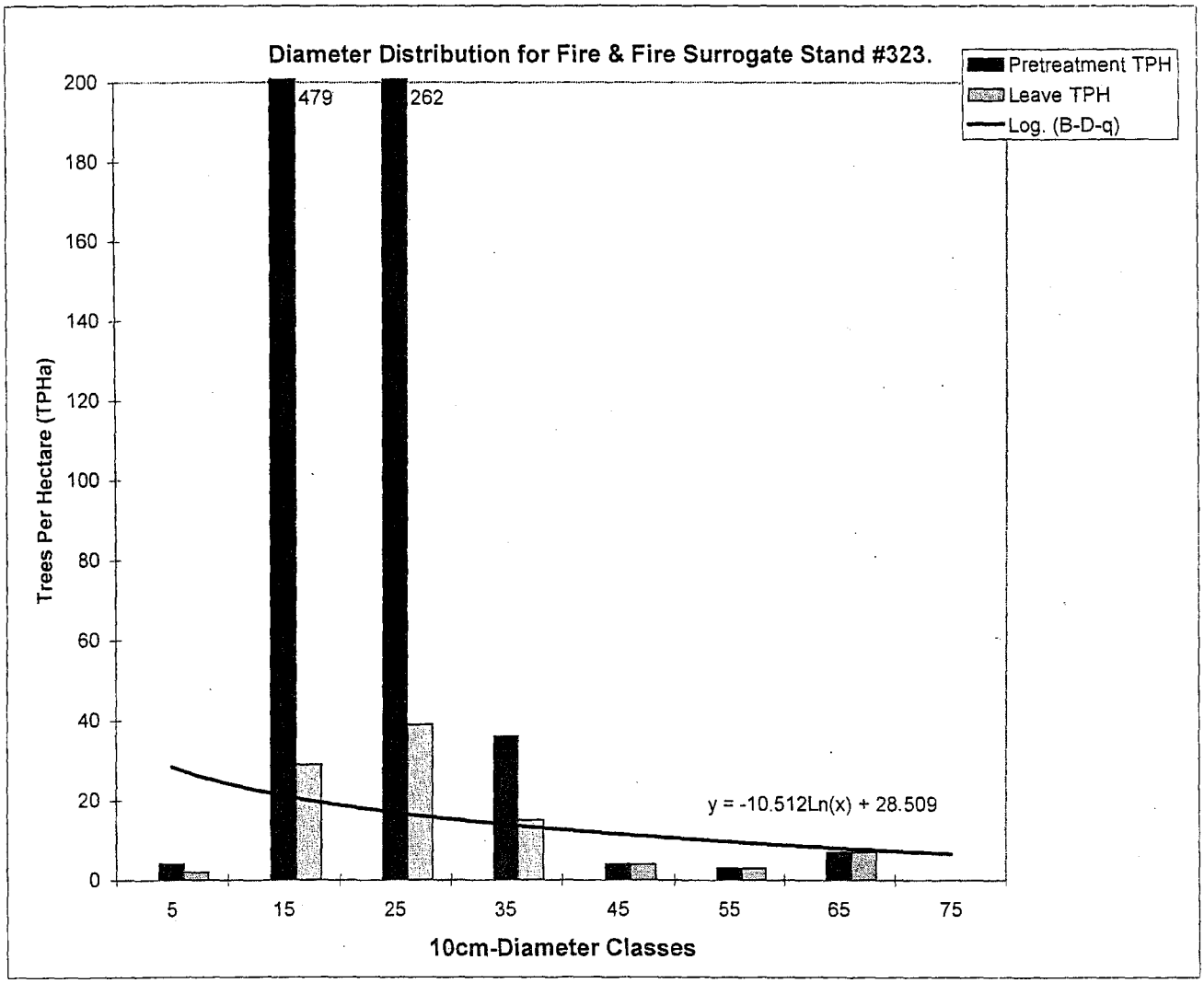
Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	68	115	83	70	38	7	6	0	387
Leave TPH	17	60	39	34	38	7	5	1	201
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	3.7	8.8	12.5	17.9	19.3	23.0	26.8		
Average H:D	81	62	50	50	44	43	40		
Average % H:D > 80	36%	12%	0%	0%	0%	0%	0%		
Average LCR	49%	58%	56%	61%	61%	62%	65%		
Keen's % A or B	3%	8%	8%	0%	10%	14%	50%		
TPA	28	47	34	28	15	3	2	0	



Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
TPH	5	507	296	56	4	6	3	1	878
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	5.8	11.1	12.7	15.3	18.3	21.3	26.6	23.7	
Average H:D	70	69	53	45	40	39	41	33	
Average % H:D > 80	17%	20%	0%	0%	0%	0%	0%	0%	
Average LCR	31%	42%	50%	59%	71%	67%	74%	73%	
Keen's % A or B	0%	4%	4%	8%	75%	83%	67%	100%	

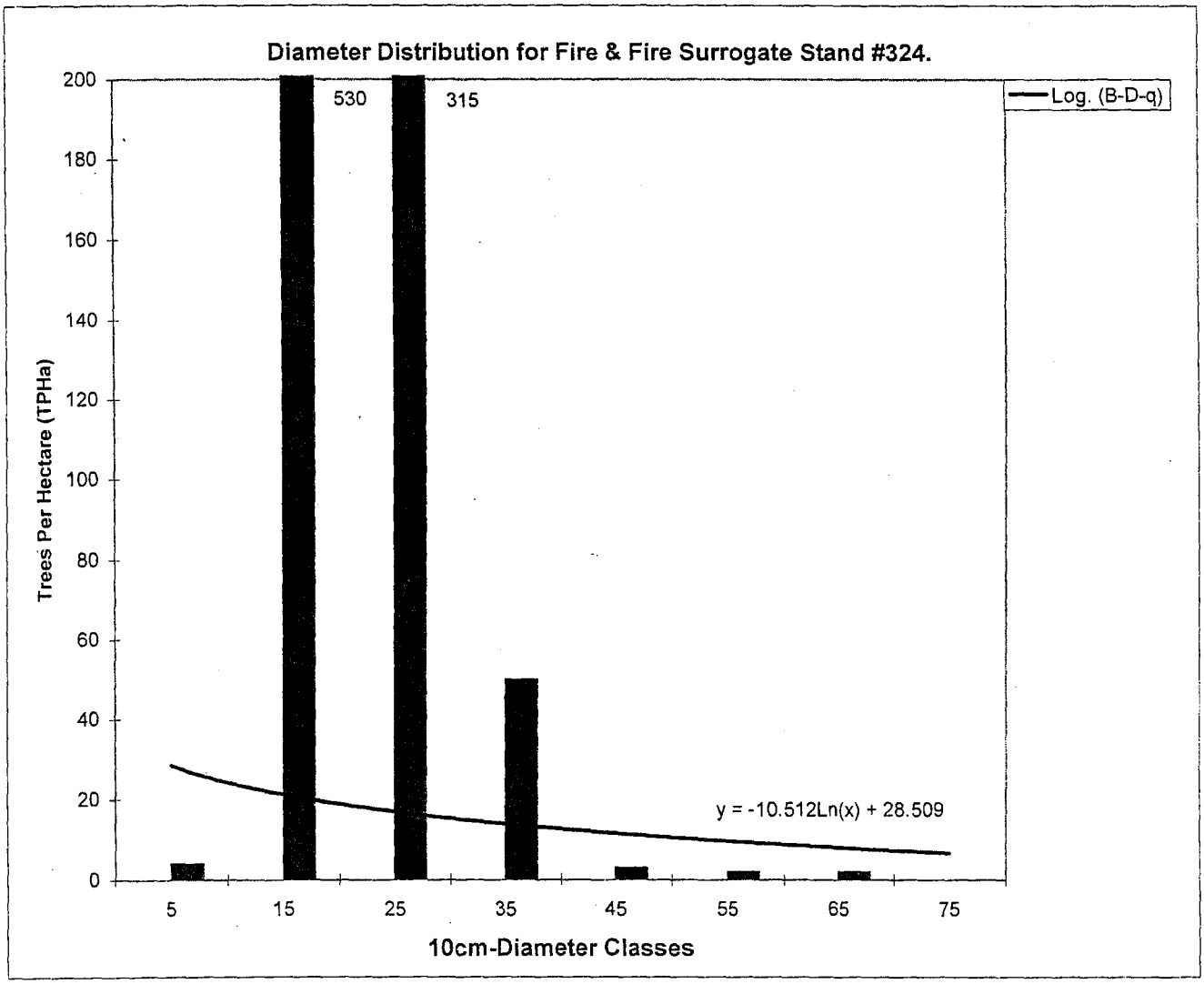


Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	19	375	188	15	1	4	7	2	611
Leave TPH	2	62	50	15	1	4	6	2	142
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	3.6	10.2	12.9	14.3	19.4	22.7	23.8	27.1	
Average H:D	79	64	55	43	43	42	38	35	
Average % H:D > 80	14%	8%	0%	0%	0%	0%	0%	0%	
Average LCR	59%	51%	53%	66%	73%	78%	72%	74%	
Keen's % A or B	13%	6%	4%	13%	100%	75%	29%	50%	
TPA	8	152	76	6	0	2	3	1	

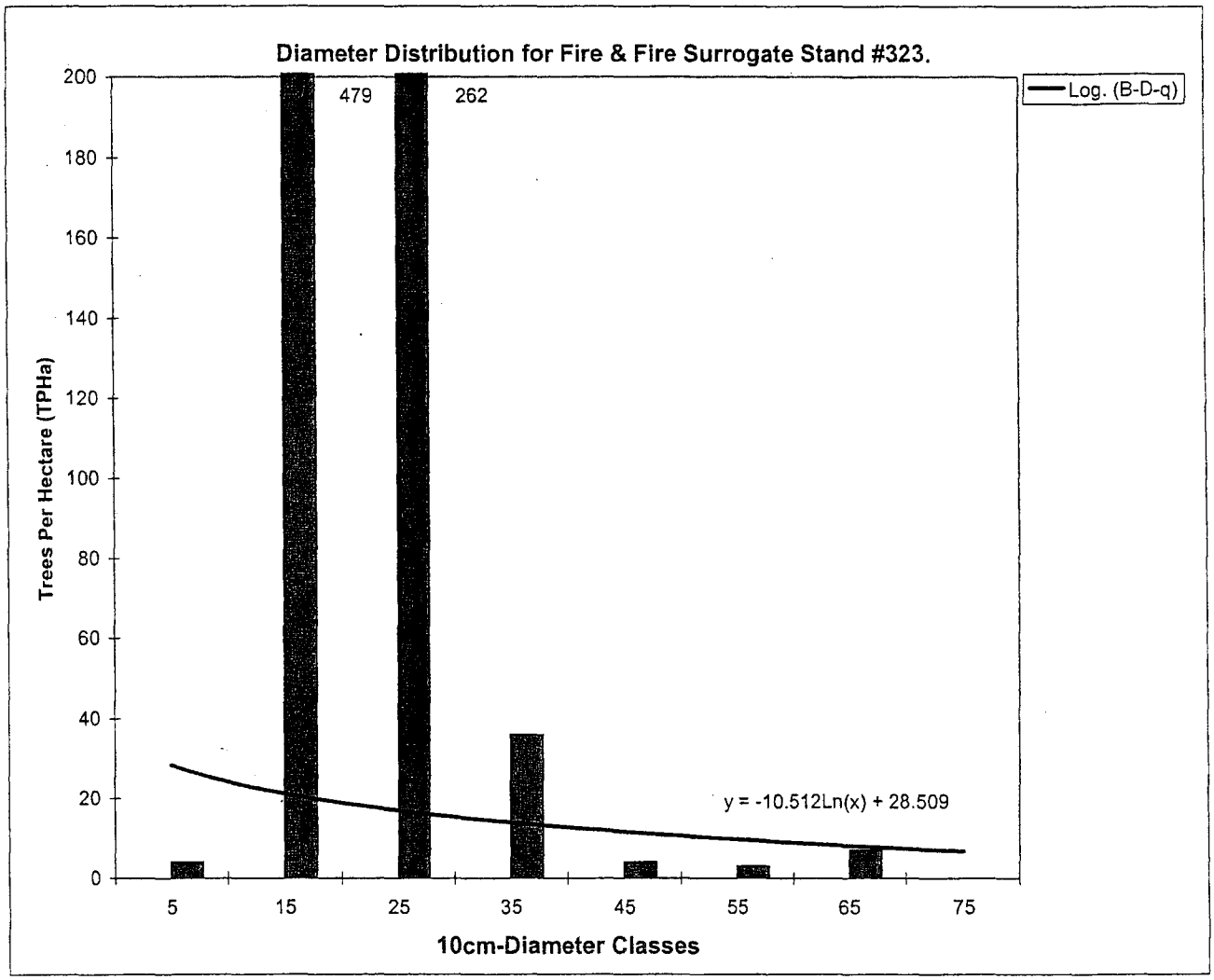


Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	4	479	262	36	4	3	7	0	795
Leave TPH	2	29	39	15	4	3	7	0	99
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	2.4	11.6	13.4	15.5	16.5	23.6	25.5		
Average H:D	65	69	56	48	36	44	40		
Average % H:D > 80	0%	16%	0%	0%	0%	0%	0%		
Average LCR	54%	47%	54%	56%	67%	72%	70%		
Keen's % A or B	0%	0%	0%	7%	0%	0%	0%		
TPA	2	194	106	15	2	1	3	0	

D-Class	TPA (Current)	TPA (Leave)
TPA 0-4.9"	52	4
TPA 5-8.9"	171	17
TPA 9+"	99	36



Diameter Class (cm)	5	15	25	35	45	55	65	75	Total
Pretreatment TPH	4	530	315	50	3	2	2	0	906
B-D-q (Target TPH)	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2	117
Average Height	4.2	10.9	13.7	16.8	17.1	22.2	23.4		
Average H:D	93	70	56	51	40	40	35		
Average % H:D > 80	33%	32%	0%	0%	0%	0%	0%		
Average LCR	60%	41%	51%	52%	69%	77%	77%		
Keen's % A or B	50%	2%	6%	0%	0%	0%	0%		
TPA	2	215	128	20	1	1	1	0	



Diameter Class	5	15	25	35	45	55	65	75
TPH	4	479	262	36	4	3	7	0
B-D-q	27.4	22.2	17.8	14.3	11.6	9.4	7.7	6.2
Average Height	2.4	11.6	13.4	15.5	16.5	23.6	25.5	
Average H:D	65	69	56	48	36	44	40	
Average % H:D > 80	0%	16%	0%	0%	0%	0%	0%	
Average LCR	54%	47%	54%	56%	67%	72%	70%	
Keen's % A or B	0%	0%	0%	6%	0%	0%	0%	
TPA	2	194	106	15	2	1	3	0

D-Class	TPA (Current)	TPA (Leave)
TPA 0-4.9"	52	4
TPA 5-8.9"	171	17
TPA 9+"	99	36

ENGLISH:

"52 - 26 - 1.24" with 4" diameter classes